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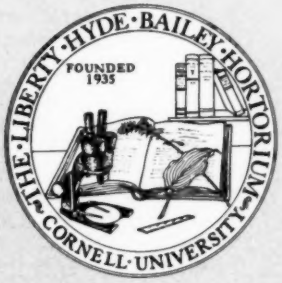

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Osmanthus heterophyllus and the Application of the Term Cultivar

Peter S. Green and James Keenan[1]

The following notes are a continuation of an earlier paper (Keenan in Baileya 5: 101; 1957) which dealt with some aspects of the application of the term cultivar. There is no doubt about the importance of this category but there is some doubt that in one respect the details and implications of the rules governing the nomenclature of cultivars, as at present formulated, are too narrowly framed.

Article 15 of the International Code of Nomenclature for Cultivated Plants (1958) states that "From 1st January 1959 onwards, the name of a cultivar (variety) must be a fancy name, that is, one markedly different from a scientific name of Latin form. This does not mean that names of Latin form published or registered before 1st January 1959 must be rejected because they are in Latin form".

Where a plant is being named for the first time this is undoubtedly right and proper, but where a plant has been widely known in cultivation for a considerable time by a Latin name under one of the botanical categories of variety, form, etc., it would hardly be wise to coin yet a further new fancy name solely for the reason that after 1st January 1959 the plant is being placed in the correct taxonomic rank of cultivar. This statement can best be illustrated by means of recently published examples taken from a revision of the genus Osmanthus (Green in Notes from the Royal Botanic Garden, Edinburgh, 22: 439, 1958) which deals with both the wild species and cultivated varieties.

Osmanthus heterophyllus

Within the genus Osmanthus one of the most widely cultivated species is O. heterophyllus (G. Don) P. S. Green (O. ilicifolius of gardens), a handsome evergreen shrub with thick holly-like leaves and a native of Japan and Formosa. Green recognizes two botanical varieties, var. heterophyllus and var. bibracteatus, of which only the former has been introduced into cultivation. It was sent to Europe in 1856 by Thomas Lobb, collecting for Messrs. Veitch,

[1] Royal Botanic Garden, Edinburgh, Scotland.

and plants were advertised at one guinea each two years later. Very shortly afterwards it was also introduced by Robert Fortune and, quite independently, to Holland by Siebold. It was presumably introduced into North America from Europe shortly after this.

The epithet heterophyllus gives some indication of the fact that considerable diversity of leaf-shape exists within the species, but in Osmanthus heterophyllus this diversity can exist on one and the same plant. This was not always realized and it is not surprising, therefore, that some of the variants assessed by Green as having no status in the wild, and here recognized as cultivars, have at various times been treated as varieties and forms, and even as species, and given Latin names which have themselves become familiar in horticultural circles.

The revision of Osmanthus mentioned above lists five cultivars within O. heterophyllus, all of them depending upon characters of the leaf for differentiation. In each case they were already provided with an established name in horticulture, often with the original authority ascribed to "Hort." The leaves of each cultivar differ in shape and colouring and their exact differentiation is seen in the key on page 78 (reference should also be made to figures 21 and 22).

The Latin name of a species covers and includes all the varieties, cultivars, and other variants within that species, as was pointed out in the paper referred to above (Keenan l. c.), and so it is with Osmanthus heterophyllus. However, the typical form, that which matches the original material upon which the Latin name is based, is also in cultivation, and to distinguish it from the five cultivars already named and yet indicate that it is the typical form to which reference is being made and not the species as a whole, the name cv. 'Ilicifolius' is hereby proposed. It was with considerable regret that in the revision of the genus the name of this species had to be changed on nomenclatural grounds from the well-known O. ilicifolius to the new combination O. heterophyllus; by the use of 'Ilicifolius' for the name of the widespread cultivar past nomenclatural usage is maintained.

cv. 'Ilicifolius'

Leaves shiny, more or less uniformly dark green above, and slightly paler green beneath, very sharply serrate with usually six, but up to eight, spinescent teeth 1-4 mm. long (figs. 21a and 22a). As with the holly, Ilex Aquifolium Linnaeus, the branches, as they reach maturity, bear leaves with fewer serrations until they are quite entire. The apices of the leaves, however, always remain spinescent. In fact, entire and serrate leaves may, on old plants, be found on the same individual and even on the same branch, and cv. 'Myrtifolius' described below has, in some respects, the appearance of the mature leaf, fixed by clonal reproduction.

Fig. 21. Osmanthus heterophyllus × 2/3: a, cv. 'Ilicifolius'; b, cv. 'Rotundifolius'; c, cv. 'Myrtifolius'.

It is a very hardy plant, hardier than holly, and particularly valuable for its ability to grow and thrive in towns and cities where industrial pollution often makes the cultivation of evergreens difficult or impossible. Although its flowers are produced somewhat meagerly in Scotland, in warmer climates it produces in the late autumn an abundance of sweet-scented small white blossoms in the axils of the leaves.

cv. 'Aureus'

Leaf shape as in cv. 'Ilicifolius' but irregularly bordered in yellow (fig. 22d).

This cultivar, together with cv. 'Variegatus' below, is not so vigorous in growth as the typical green-leaved expression of the species nor is it quite so hardy, often shedding a number of leaves in severe frost. It was known and named in cultivation long before a name and description were officially published and whilst the first published name that has been traced was var. foliis-aureo-variegatus, given without description by Lavallée in 1877, the epithet "aureus" was first published by Bailey in 1901 in his Cyclopedia of American Horticulture 3: 1177.

cv. 'Myrtifolius'

Leaves entire, elliptic to elliptic-oblong, unarmed except for a spine-tipped acute or acuminate apex (figs. 21c and 22e). They resemble the entire and mature form found on the typical species and it is probable that this is the mature expression of the leaf, kept stable by clonal reproduction.

It is one of the most handsome of the cultivars and forms a dense bush reaching, if allowed to grow freely, up to 3 m. or so in height.

cv. 'Purpureus'

Leaves the same in shape as cv. 'Ilicifolius' but, together with the shoots, tinged with purple and, when young, quite purplish-black in colour (figs. 21a and 22a). The colour fades with age, remaining longest on the underside of the leaf and old leaves look very similar to cv. 'Ilicifolius'.

This cultivar is said to have been raised at the Royal Botanic Gardens, Kew, in 1880, and because it is reputed to be the hardiest form on record, having endured 25° of frost, it is one of the most valuable of evergreen shrubs in cool temperate regions.

cv. 'Rotundifolius'

Leaves more or less rounded at the apex, obovate in general outline, but the usually entire margin often shows slight irregu-

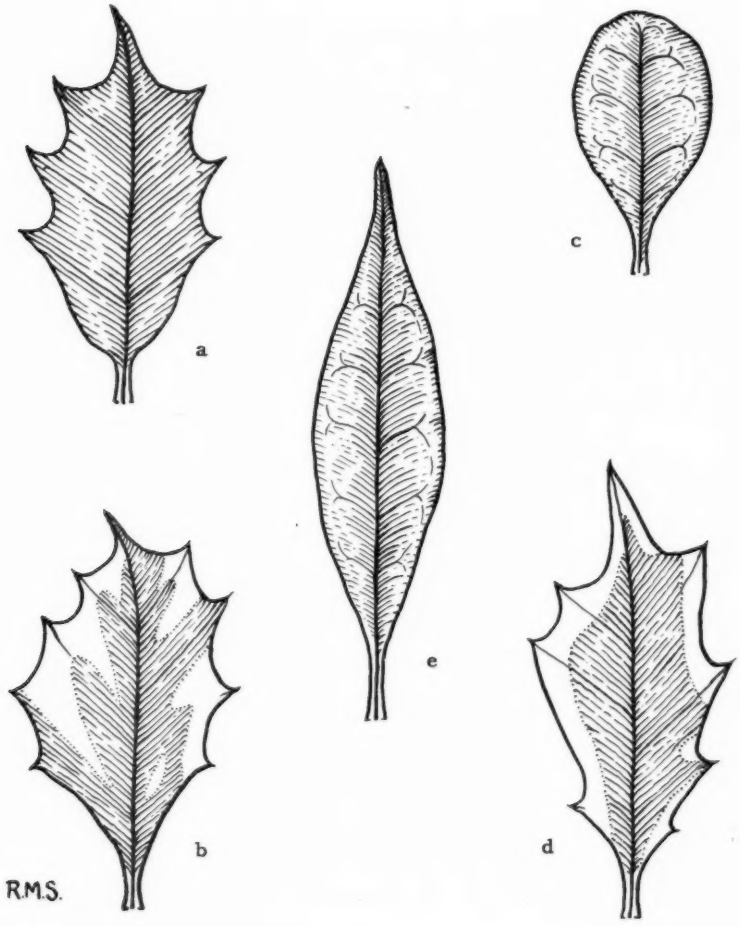

Fig. 22. Single leaves of cultivars of Osmanthus heterophyllus × 1: a, cv. 'Ilicifolius' (cv. 'Purpureus' is similar); b, cv. 'Variegata'; c, cv. 'Rotundifolius'; d, cv. 'Aureus'; e, cv. 'Myrtifolius'.

larities. The margin is also somewhat undulate and the base of the leaf distinctly cuneate (figs. 21b and 22c).

Of the various cultivars within this species, this is perhaps the slowest grower, tending to make a dwarf bush. It was certainly grown by the Japanese more than a century ago for there is a specimen in the Reijksherbarium at Leiden collected by Bürger, who botanized in Japan between 1830 and 1835.

cv. 'Variegatus'

Leaves resembling cv. 'Aureus' but the light-coloured margin, whitish or cream and never a clear yellow, is often less broad, with perhaps a greater tendency to develop into streaks which occasionally reach the midrib. Furthermore, the margin of the leaf is less regularly serrate and often quite asymetrical and irregular (fig. 22b).

Key to the Cultivars of Osmanthus heterophyllus

1. Leaves more or less uniform in colour.
   2. Margin of leaf entire or undulate.
      3. Tip of leaf rounded, margin undulate. . . . . 'Rotundifolius'
      3. Tip of leaf sharply spinescent, margin plane. . . . . 'Myrtifolius'
   2. Margin of leaf serrate with teeth 1-4 mm. long.
      4. Leaf dark green, paler beneath. . . . . 'Ilicifolius'
      4. Leaf tinged purple, especially beneath and when young. . . . 'Purpureus'
1. Leaves margined or striped with cream or yellow.
   5. Serration of leaf more or less regular, margin coloured yellow. . . . . 'Aureus'
   5. Serration of leaf more or less irregular, margin coloured white or cream. . . . . 'Variegatus'

These cultivars, as we see, are distinguished by their leaves which may be clear green, margined with yellow, entire and elliptic, purplish-tinged, entire and rounded at the apex, or margined with creamy-white. What more apt names are there than 'Ilicifolius', 'Aureus', 'Myrtifolius', 'Purpureus', 'Rotundifolius' and 'Variegatus' - the names given them as cultivars and the names under which they have already been known for years in horticulture? These names, with the exception of the first, have been published prior to 1st January, 1959, and so stand as valid under the International Code of Nomenclature and it is submitted that any other names given to them as cultivars would be far less suitable, primarily because the name under which they are already known in cultivation thereby would have been changed, surely a negation of stability, one of the main objectives behind the International Code. It is far better in such cases to allow the Latin name to be brought over from the botanical category to the cultivar with, of course, the recognised changes in the form of type - a capital initial, single quotation marks, and no italics.

Finally it might not be out of place to take the opportunity to deprecate the tendency in certain quarters to typify and apply the rigid rules of priority in the choice of the name for the cultivar taken over from botanical nomenclature. In the case of Osmanthus heterophyllus cv. 'Rotundifolius', the earliest epithet known is cuneatus given to the plant as a botanical form in 1866 by the Dutch botanist Miquel and then raised by him to varietal level status in 1870. The name rotundifolius was not published until 1884 and although cuneatus has been used by no other person subsequent to Miquel, if either of the botanical ranks of variety or form is used for the plant, cuneatus is the name which must be used - but it is not the name known in horticulture. With the change in rank one should be able to retain the name in current usage, even though typification cannot be based on any material seen by the original author as could be done if the epithet cuneatus were used. It cannot be too strongly stated that these rules should be designed for the benefit of the cultivator, and, since no cultivar name can ever be in conflict with botanical nomenclature, the choice should always be that which least upsets current practice; in fact, their formulation and interpretation should always be based on common sense.

To sum up, therefore, we urge that Article 15 of the International Code for the Nomenclature of Cultivated Plants be broadened and so worded that: (1) Latin epithets may continue to be given to cultivars even after 1st January, 1959, in those cases, and only in those cases, where the cultivar is already known under a botanical category, and (2) that on the transference of the plant from a botanical category to cultivar, the epithet chosen for it should be that which is most widely used and not necessarily the earliest one published. The following amended wording for Article 15 has therefore been sent to the Secretary of the International Commission for the Nomenclature of Cultivated Plants of the International Union of Biological Sciences, in accordance with Article 56 of the Code ("Modification of the Code"):

> "From 1st January 1959 onwards, the name of a new cultivar (variety) must be a fancy name, that is, one markedly different from a scientific name of Latin form unless the cultivar (variety) is one which has already been known in one of the categories recognised in the International Code of Botanical Nomenclature, when, in the interests of stability, the name in Latin form may be used. Under these circumstances and irrespective of botanical rank, general usage and not priority should govern the choice of name.
>
> "Names in Latin form published or registered before 1st January 1959 will not be rejected because they are in Latin form."

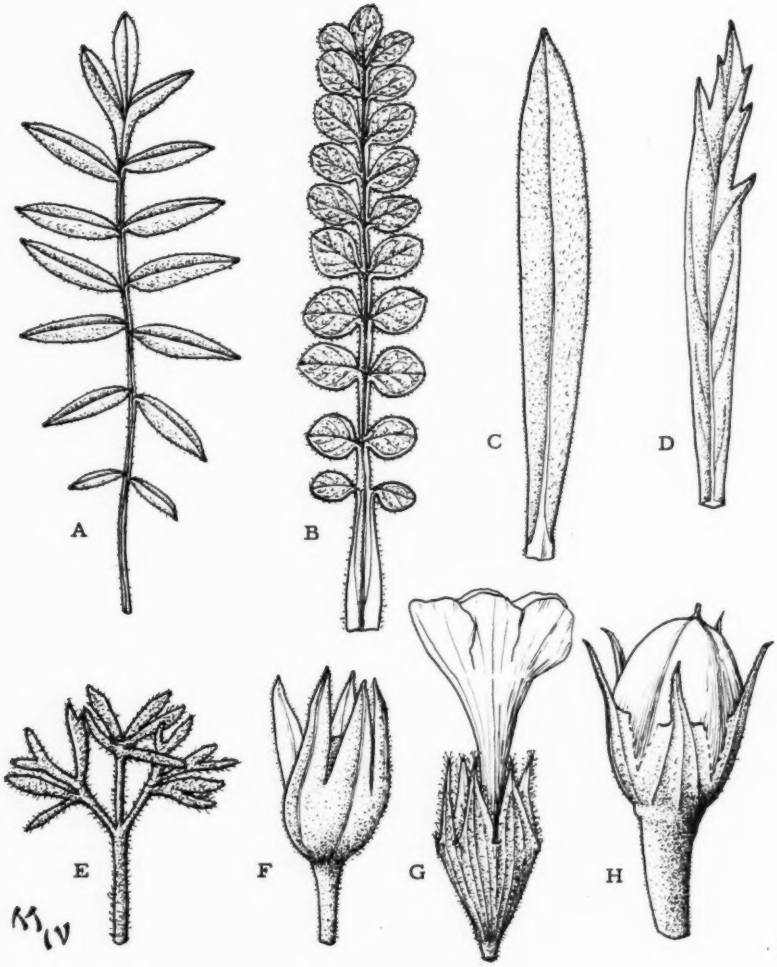

Fig. 23. A, Polemonium pauciflorum, leaf × 1. B, P. elegans, leaf × 2. C, Collomia grandiflora, leaf × 2. D, C. Cavanillesii, leaf × 2. E, C. Larsenii, leaf × 3. F, Polemonium foliosissimum, calyx enclosing fruit × 3. G, Collomia debilis, flower × 3 (note pitcher-lip-like sinuses of calyx). H, Phlox paniculata, calyx split by developing capsule × 4.

Notes on the Cultivated Polemoniaceae

1. A Key to the Genera

John Ingram

One might think offhand that a family of plants with its center of distribution mainly in the United States would have had its genera well defined and circumscribed for at least forty or fifty years. This is not true in the case of the Polemoniaceae, and only in recent years has there been any semblance of unanimous agreement among the students of the family on how to delimit the genera, even though the need had been apparent for a very long time.

The Polemoniaceae are a natural family comprising eighteen genera (Grant, Natural History of the Phlox Family, 280 pp., 1959), and can be classified into two main groups, one composed of the genera essentially from tropical areas and the other of those of the temperate region. There is no problem in defining the five tropical genera; of these, only Cantua and Cobaea are in cultivation in the United States, although Loeselia mexicana has been cultivated in botanic gardens, and may be still in cultivation somewhere in the warmer parts of the United States, though there seems to be no recent record of it.

General agreement as to the generic limits of the temperate genera has come about only gradually within the last thirty years, largely through the studies of Drs. Edgar Wherry, Herbert L. Mason, and Verne Grant. Obviously, complete unanimity in the definition of genera as well as the species probably will never be reached, since we are working with living things, and taxonomic opinion naturally must be taken into account. At any rate, examination of recent floras reveals a far different concept of the genera, particularly of the genus Gilia, from the view that prevailed in the time of George Bentham and Asa Gray, or even that of A. Brand, who presented a general treatment of the family in 1907 (in Engler, Das Pflanzenreich 27 [IV. 250]: 1-203).

All the extensive family-wide studies of the Polemoniaceae through 1907 were made by men who lived either in Europe or in the eastern United States, quite remote from the plants as they grow and evolve in nature; therefore, most of the early work, out of necessity, was carried out essentially from the study of dry

herbarium specimens or material grown in gardens. These early workers knew nothing of cytology, and, lacking the field experience which is so essential to the understanding of the relationship of the various taxa, solved many of their problems by wholesale placement of their new species of questionable generic affinities in the genus Gilia.

In the latest comprehensive study of the phlox family, Grant has brought together the known facts from the various botanical disciplines and has arrived at a total of eighteen genera. Members of twelve of these genera are in cultivation in the United States. It is interesting to note that, of these eighteen genera, all but three had been described by 1900, and, of these three, Eriastrum was erected by Wooton and Standley in 1913 in place of the preoccupied genus Hugelia described by Bentham in 1833, and only Huthia Brand, 1908, and Allophyllum A. and V. Grant, 1955, are new.

Linnaeus described the first three genera of the phlox family in 1754, and succeeding genera were described at fairly regular intervals up to 1908. In 1833, Bentham (in Edwards's Botanical Register 19: under plate 1622) published a summary of the genera represented by material just received from California by the Horticultural Society. At that time he described Linanthus, Hugelia (now Eriastrum), Aegochloa (a synonym of Navarretia), and two other genera now regarded as synonyms of Linanthus. By 1876 Bentham, after having studied many additional specimens, obviously changed his concept of these genera, and reduced them to sections of the genus Gilia; so of the temperate genera, he recognized only Phlox, Polemonium, Collomia, and Gilia. It is obvious that Bentham and Gray influenced each other in the attempt to define these genera, and Bentham's influence is evident in Gray's first revision of the Polemoniaceae in 1870 in which he recognized these same genera.

By the time Gray offered his last revision in 1886, he became disturbed over the problem that he could not seem to segregate the species into definite, smaller genera. The confusion mainly derived from the fact that in the early genera, such as Collomia and Linanthus, Bentham and others included certain species which did not belong to them. Therefore, it was only natural that confusion should result, and finally Gray became frustrated over his inability to find certain key characters by which he could unequivocally distinguish these genera. The confusion grew with time, and eventually Gray, in desperation, reduced the number of genera to three: Polemonium, Phlox, and Gilia. His Gilia became a complex, unwieldy assemblage of sections with elements of what are now considered genera often spread between at least two of his sections. This situation resulted because both Bentham and Gray, in reducing the former genera to sections, left them constituted essentially as they had been in the beginning, so that reducing heterogeneous

genera to heterogeneous sections accomplished nothing in the matter of making more natural groups. Gray's circumscription of the genus Gilia in 1876 admits about 95 species. Grant has pointed out the interesting fact that all but nineteen of these species of the temperate genera, aside from Polemonium and Phlox whose generic boundaries have remained essentially unchanged throughout their history, have been placed, at some time, in Gilia, but yet Gilia is the second largest genus and the most heterogeneous in the Phlox family. The species Gray included in Gilia are now to be found in the following genera: Gilia, Collomia, Eriastrum, Ipomopsis, Langloisia, Leptodactylon, Linanthus, Navarretia, Allophyllum, and Gymnosteris (the latter two are not in cultivation).

Mason, in his paper "The genus Eriastrum and the influence of Bentham and Gray upon the problem of genera confusion in Polemoniaceae" (Madrono 8: 65-91, 1945) and Grant (Natural History of the Phlox Family, 1959) have presented in detail the reasons for the confusion which existed for so long in defining the genera of the family. They recognize the problem to be one of reluctance on the part of subsequent botanists to disagree with the two eminent botanists Bentham and Gray, who, because of their renown, have been considered by many to be botanically infallible; however, this ultra-conservative point of view is no longer held by students of the family. This shift from the very conservative concept, and the movement for removing discordant elements from Gilia, were begun by E. L. Greene of California, who, about the turn of the century, took up the already-described genera Collomia, Linanthus, and Navarretia, and in addition, described three new genera, Langloisia, Microsteris, and Gymnosteris (the latter two not cultivated). His lead was followed by others and, one by one, groups of species have been removed from Gilia and restored to a previously described genus or a new genus, making Gilia a much more natural taxon. This progress is reflected in the succeeding floras and manuals of the western United States.

The genera, since they cannot be separated one from another by a single key character, are obviously then characterized by a combination of characters. When one becomes familiar with the overall characteristics of the genera, one will find that they are readily distinguished as definitive taxa. Mason has pointed out that even though Eriastrum and Navarretia are closely related, they are definitely distinct genera and rarely confused in the herbarium.

In view of the conservative approach employed in Hortus Second, Bailey's Manual of Cultivated Plants, and most other horticultural literature, it seems worthwhile to present a key to the cultivated genera of the phlox family. Illustrations are included to elucidate certain portions of the key.

1. Plants climbing by tendrils. . . . . Cobaea
1. Plants not climbing.
   2. Mature capsule not rupturing or distending the calyx (fig. 23F).
      3. Plants shrubs or small trees; seeds winged. . . . . Cantua
      3. Plants annuals or rhizomatous or cespitose perennials; seeds not winged.
         4. Leaves uniformly pinnately compound with 7 or more leaflets, the leaflets usually distinct except the terminal 3 or 5 sometimes confluent (fig. 23A, B); sinuses of calyx never distended. Polemonium
         4. Leaves simple, entire, or 3- to 7-lobed, or sometimes dissected (fig. 23C, D, E), sinuses of the calyx often distended like the lip of a pitcher (fig. 23G). . . . . Collomia
   2. Mature capsule rupturing or distending the calyx (fig. 23H).
      5. Leaves alternate.
         6. Calyx lobes unequal in length (figs. 24Ac, Bc).
            7. Plant, particularly the inflorescence, with matted, tangled, cobwebby woolly hairs giving it a felty appearance; anthers sagittate (fig. 24Bd). . . . . Eriastrum
            7. Plant with glandular hairs, glabrous, or rarely villous, never appearing felty; anthers oval (fig. 24Ad). . . . . Navarretia
         6. Calyx lobes equal in length (fig. 25C).
            8. Plants shrubs or subshrubs; leaves palmately divided, less than 13 mm. long, densely fascicled, densely clothing the stems. . . . . Leptodactylon
            8. Plants annuals, biennials, or herbaceous perennials (one species a shrub, not in cultivation); leaves simple, pinnatifid, or pinnately dissected, over 13 mm. long, often in a basal rosette.
               9. The plants low tufted annuals to 20 cm. tall; leaves pinnately toothed and bristle-tipped, the bristles simple or 2-3-forked; calyx lobes spine-tipped (fig. 25). . . . . Langloisia
               9. The plants annuals, biennials, or perennials, the cultivated species often 30 cm. or more tall; leaves simple or dissected, not bristle-tipped; calyx lobes not spine-tipped.
                  10. Spring-blooming, mostly annuals, some biennials or perennials; stems mostly scapose with the upper cauline leaves greatly reduced; bracts subtending groups of flowers or inflorescences; corollas typically funnelform. . . . . Gilia
                  10. Summer-blooming, mostly perennials, some annuals; stems with well-developed cauline leaves; each individual flower subtended by a bract; corollas typically salverform. . . . . Ipomopsis
      5. Leaves opposite or subopposite, or sometimes the upper leaves alternate or leaves of the inflorescence alternate.
         11. Leaves always simple, though sometimes crowded and linear or subulate; stamens irregularly inserted on corolla. . . . . Phlox

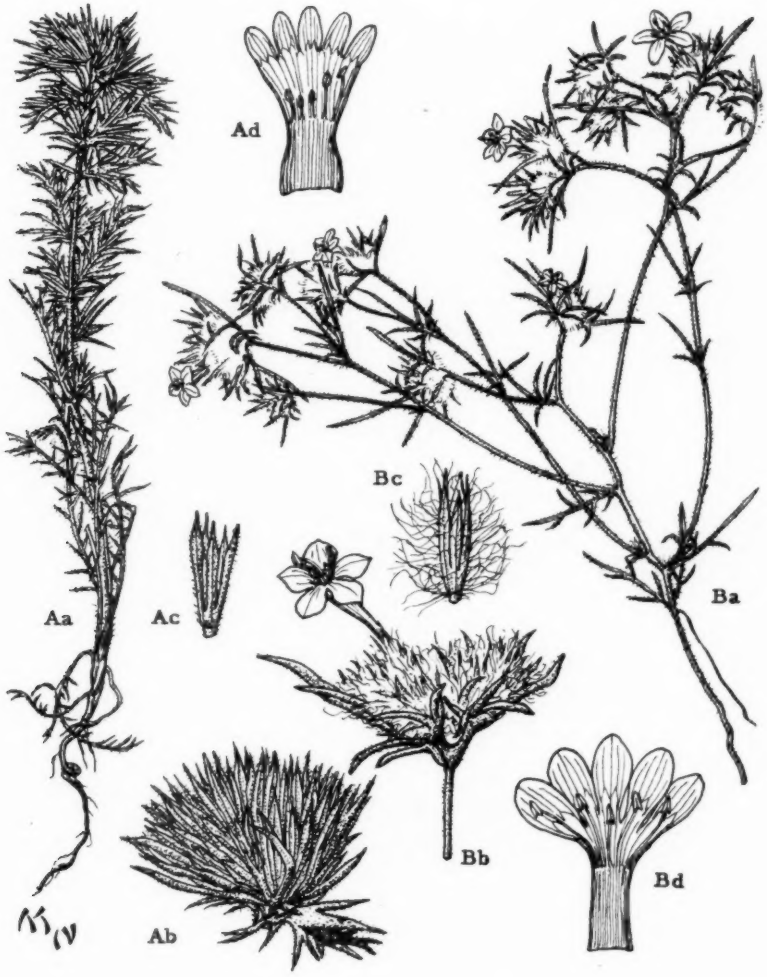

Fig. 24. A, Navarretia mellita: a, habit × 4/5; b, inflorescence × 2; c, calyx × 2; d, corolla split and expanded × 3. B, Eriastrum eremicum: a habit × 4/5; b, inflorescence × 2; c, calyx × 3; d, corolla split and expanded × 2.

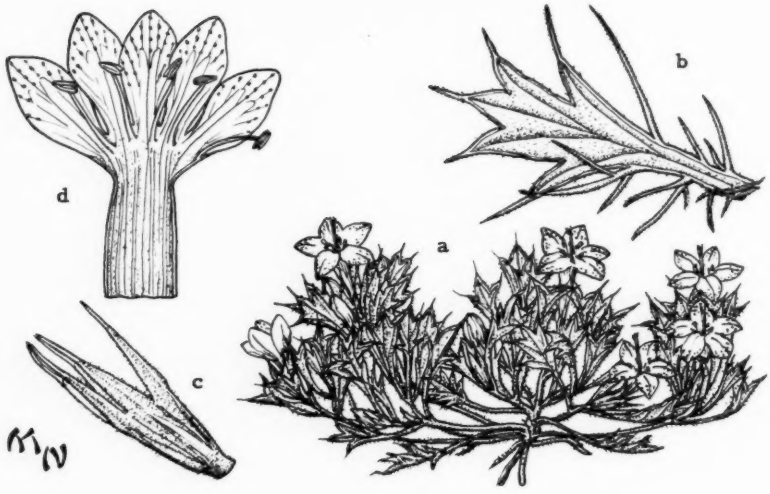

Fig. 25. Langloisia punctata: a, habit × 4/5; b, leaf × 3; c, calyx × 3; d, corolla split open and expanded × 2.

11. Leaves mostly palmately divided, or, if simple, then the plant a low annual with linear-filiform leaves; stamens regularly inserted on the corolla.

    12. Plants annuals except for one woody-based perennial; leaves not with pungent lobes, mostly palmately lobed except for one annual with simple linear-filiform leaves; internodes mostly much longer than the leaves, leaves opposite. . . . . Linanthus

    12. Plants shrubs or subshrubs; stems woody, densely clothed with persistent leaves which are palmately divided into pungent lobes, the internodes very short, about the length of the leaves or shorter; leaves rarely opposite, mostly alternate or subopposite. . . . . Leptodactylon

The Cultivated Species of Carissa

George H. M. Lawrence

Throughout the tropics and subtropics, among the more common evergreen hedge plants are those belonging to the genus Carissa, a group of perhaps 70 species and a member of the dogbane or Apocynum family. Perhaps the scarlet-fruited Natal-plum (C. grandiflora) is one of the best known of the cultivated species. The plants are grown also for foundation plantings in the home landscape and for their red, pulpy, tart fruit used in making jellies.

Related to Carissa is the wintersweet shrub, generally known as Acokanthera spectabilis. The genus Carissa is generally said to be distinguishable from Acokanthera by the presence of thorns or spines in the former (absent in the latter). However, the leading monographer of the family, the late Marcel Pichon (1921-1954), demonstrated that this distinction is not reliable (e.g., wild plants of Carissa edulis may be spiny or spineless), and he combined the two genera as one, taking up for it Linnaeus' older name, Carissa. This worldwide study by Pichon (in 1948), although known and widely accepted by botanists, is not known to have been brought to the attention of horticulturists. It was published in Mémoires du Muséum National d'Histoire Naturelle, n.s. 34(3): 130-133, 1948 (Classification des Apocynacées. I. Carissées et Ambelaniées).

Three species formerly considered to belong to Acokanthera and seven in Carissa are reported to be grown in this country. The following key presents characters by which they may be identified:

1. Plants spineless.
   2. Lvs. elliptic to elliptic-oblong.
      3. Tree 4-6 m. tall; corollas 2-2.5 cm. long, minutely hairy; fruit oblong-ellipsoid, mostly 3-5 cm. long . . . . . C. longiflora
      3. Shrub or scrambling vine; corollas 1-2 cm. long, glabrous except for ciliate lobes; fruit globose, mostly 1-2 cm. in diam. . . . . C. edulis
   2. Lvs. ovate, some becoming ovate-elliptic.
      4. Fls. mostly in terminal flat-topped corymbs, 3.5-5 cm. across, the corolla-tube 2.5-3 cm. long . . . . . C. spectabilis
      4. Fls. mostly in axillary elongated paniculate infls., the corolla-tube about 1.5-2.3 cm. long . . . . . C. Acokanthera

1. Plants spiny.
   5. Corolla lobes much longer than the tube, the fls. about 5 cm. across; frs. with 8-16 seeds or more . . . . . C. grandiflora
   5. Corolla lobes shorter than the tube, the fl. 2.5 cm. across or less; frs. with 1-6 seeds
      6. Spines mostly forked.
         7. Tube of corolla about 0.5 cm. long; fr. scarlet, seeds 1-2 . . . . . C. bispinosa
         7. Tube of corolla about 2 cm. long; fr. black, seeds 4-6 . . . . . C. Carandas
      6. Spines mostly simple.
         8. Style very slender and filiform, ovary silky-hairy at apex . . . . . C. ovata
         8. Style stout, not filiform, ovary glabrous throughout.
            9. The lvs. green, paler beneath but not glaucous, not thick-leathery, veins mostly in 6-8 pairs.
               10. Lvs. mostly obtuse . . . . . C. Carandas
               10. Lvs. mucronate to acute . . . . . C. spinarum
            9. The lvs. glaucous above and below, thick-leathery, veins mostly in 3 pairs . . . . . C. edulis

Those cultivated species whose names are changed because of this unification of two groups hitherto treated as separate genera, or for other reasons, are treated below.

C. Acokanthera Pichon. Bushman's Poison

This is the plant long-known as Acokanthera venenata (Thunberg) G. Don, but is not the same plant as one named earlier C. venenata (H. Baillon) J. Palacky. Since a new name had to be given, Pichon applied its former generic name as a species epithet.

C. bispinosa (Linnaeus) Desfontaines. Hedge-thorn.

Lamarck named this Carissa Arduina in 1785, a name by which it was known for many decades. However, it was known earlier to Linnaeus, who placed it in a separate genus and named it Arduina bispinosa. During the nineteenth century it was common practice to accept for a species the oldest name given it in the genus where it was believed to belong. This also meant that one was not then bound to carry over a specific epithet from combination with one genus to another. Hence, at that time, Lamarck violated no rule when he ignored Linnaeus' epithet bispinosa as used earlier in another genus, and substituted his own. Allowance of this practice was changed in 1905 by international agreement, when it was determined that - barring a resultant duplication of names - the original epithet must be retained regardless of the genus in which the species is placed. The hedge-thorn is sometimes, but incorrectly, known also by its synonym, Carissa acuminata A. de Candolle.

Fig. 26. Carissa grandiflora.

The name Carissa coriacea Wallich appears in the literature and in American lists of available plants. Originally applied to a Mauritian species, it is actually of uncertain application in horticulture and some of the material so-named is only a variant of C. Carandas Linnaeus, the Malaysian karanda.

The name of the Natal-plum (C. grandiflora) is unaffected by unification of these two genera. It is of interest to note, however, that two cultivars of it are now offered in the American trade: 'Prostrata', a low flat spreading plant of slow but open growth, and 'Tuttlei', with densely compact spreading branches and rich green foliage. Plants passing in the trade as C. minima are probably dwarf cultivars of this species.

An East African species has been introduced from Kenya, where it is known as Acokanthera longiflora Stapf and grows as a spineless tree 4-6 m. tall. It is now considered to be a species of Carissa and the new name, Carissa longiflora (Stapf) Lawrence, is here published for it (based on Acokanthera longiflora Stapf in Kew Bulletin, 1922, p. 28).

The wintersweet, a large spineless shrub from southwest Africa, with corymbs of white flowers, is a third species transferred by Pichon from Acokanthera (A. spectabilis (Sonder) Hooker fil.) to Carissa (C. spectabilis (Sonder) Pichon). The leaves are larger than in most cultivated species (usually 6-10 cm. long) and the flowers are borne in flat-topped corymbs and their corolla-tubes are 2.5-3.5 cm. long.

The species named C. spinarum by Alphonse de Candolle is grown in southern California. Although it is so close to C. Carandas as scarcely to merit specific distinction, it is being kept distinct pending further study.

A FURTHER NOTE ON DICHORISANDRA REGINAE

Shortly after a recent article on Dichorisandra Reginae had been published (Baileya 5: 121-125, 1957), I chanced to see a recently arrived fascicle of the second edition of Parey's Blumengärtnerei which is currently appearing in parts under the editorship of Fritz Encke. The fascicle, which contains a treatment of Commelinaceae by Dr. Wolfgang Ludwig, had been received at the A. R. Mann Library at Cornell University on August 29, 1957. Therein I found that the combination Dichorisandra Reginae had been made. The proper citation for the combination, therefore, should read as follows:

Dichorisandra Reginae (L. Linden & Rodigas) Hort. ex Ludwig in Encke, Parey's Blumengärtnerei, ed. 2, 1:223, 1957.

H.E.M., Jr.

Bougainvillea in the Philippines

Juan V. Pancho and Eliseo A. Bardenas[1]

Although Bougainvillea is a genus of common plants that have long been the object of botanical collections and description, very little is known of their systematics. This is due perhaps to the innumerable cultivars and host of hybrids, resulting in considerable confusion in their identity.

Plants of this genus were first noted and collected, in Brazil, by the French botanist Commerson, who named it for L. A. de Bougainville, with whom he was travelling around the world during the years 1766-1769. As originally published in A. L. de Jussieu's Genera Plantarum (p. 91) in 1789, where it was attributed to Commerson, the name was spelled Buginvillaea, but later authors used the spellings Bougainvillaea or Bougainvillea, or other variations. The spelling Bougainvillea, as used by Spach in his Histoire naturelle des Végétaux, Phanerogames (1841), has been officially conserved in place of the original Buginvillaea. Publication of the name, as may be seen, did not occur until more than twenty years after the genus was discovered, and it was even later that living plants were brought to Europe.

In his monograph of the genus, Heimerl (1900) recognized ten species. Of these, only three are of horticultural importance: B. spectabilis, B. glabra, and B. peruviana. Although he recognized variation in the size and color of bracts within the species B. spectabilis and B. glabra, and described two varieties in B. glabra besides the typical form, he did not go further to distinguish by name the many horticultural varieties with minor differences.

Standley (1931), in treating the genus, also did not attempt to recognize cultivars, being concerned only with the wild species.

Holttum (1955, 1956, 1957) has recently given a rather full account of the genus as it exists in cultivation in Malaya. He has

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treated three natural species and one hybrid group, with their many cultivars, including a list of the hybrids recorded up to the date of publication (1956). It is to his work that the present authors are indebted for much of the information included herein.

Merrill (1923) recorded one species of this genus in his An Enumeration of Philippine Flowering Plants. This species, B. spectabilis, was probably introduced into the islands by the early Spanish settlers. Later, B. glabra and B. peruviana were introduced. The numerous hybrids and cultivars in the Philippines have arisen either as sports or hybrids between these species.

Bougainvilleas are climbing shrubs but are often pruned and grown as pot plants. The leaves are alternate, petioled, ovate to elliptic-lanceolate. There is inconsistency in the shape, size, and indument of the leaves, even in the same species. In spite of this, leaves offer some fairly reliable characteristics for the taxonomic diagnosis of the different species. Leaves chosen from different plants for purposes of comparison should be from similar parts, since the leaves of terminal branches, for instance, may differ considerably from those of strong new suckering stems. Thorns are present in the axils of many leaves, and it is by means of these that the plants are able to clamber, vine-like, through other plants. Pijl (1951) reports that these stiff, curved thorns are inflorescence thorns, comparable to the hooks of Uncaria and Artabotrys.

The flowers, commonly borne in groups of three, are small and inconspicuous, but each is subtended by a showy bract. One flower, considered to be the terminal one, opens before the other two. The flower is tubular, but constricted near the middle of the tube and somewhat swollen below that point; five ridges run the length of the tube and terminate in the rays of a five-pointed "star" formed in the expanded limb of the flower. The tube and limb represent the calyx, for there is no true corolla. Eight stamens of different lengths, and ordinarily included within the tube, arise from the edge of the nectary-gland located below the ovary. The ovary contains only one ovule and, therefore, only one seed when and if it develops into a fruit.

The many variations in color are obviously a result of interbreeding involving several backcrosses. This is exemplified by B. × Buttiana, a hybrid between B. peruviana and B. glabra. Also, the authors have strongly suspected hybridization between B. glabra and B. spectabilis. We are recording these opinions with the hope that they will stimulate further observations in the field.

The multiplicity of cultivar names for essentially similar populations of Bougainvillea has been due to an inadequate awareness of the range of variability. Many of the species show variation in leaf and inflorescence characters which have led astray earlier students

Fig. 27. Bougainvillea peruviana. Reproduced from Humboldt and Bonpland, Plantes aequinoctiales, 1808.

of the genus. Bougainvillea glabra from Cebu offers examples of such variations to a limited degree. Bougainvillea spectabilis and its hybrids also have caused much taxonomic confusion by their variability. Fairly abundant collections have been made of it, both for botanical and horticultural purposes, and they have provided adequate materials for this study.

1. Perianth-tube, leaves, and stems glabrous to more or less puberulent, the hairs to 0.8 mm. or less long.
   2. Perianth-tube, leaves, and stems glabrous, except the lower surface of rays; the tube less than 1 mm. across. . . . . B. peruviana
   2. Perianth-tube, leaves, and stems puberulent; the tube 1 mm. or more across.
      3. Leaves broadly-ovate; bracts orange,[1] yellow, purple, scarlet, carmine, or oxblood red; edges of bracts much crisped.
         4. Bracts orange or yellow.
            5. Stamens enclosed within perianth-tube.
               6. Bracts Apricot Orange to Vinaceous Orange. . . . . B. × Buttiana 'Mrs. McClean'
               6. Bracts Antimony Yellow to Bittersweet Pink. . . . . B. 'Golden Glow'
            5. Stamens exserted. . . . . B. × Buttiana 'Louis Wathen'
         4. Bracts purple, carmine, scarlet, or oxblood red.
            7. Flower-tube closed at flowering.
               8. Bracts Amaranth Purple. . . . . B. × Buttiana 'Scarlet Queen'
               8. Bracts Carmine to Nopal Red. . . . B. × Buttiana 'Miss Manila'
            7. Flower-tube opened at flowering.
               9. Bracts Rhodamine Purple to Rosolane Purple. . . . . B. × Buttiana 'Mrs. Butt'
               9. Bracts Scarlet or Oxblood Red.
                  10. Bracts Scarlet to Grenadine. . . B. × Buttiana 'Miss Luzon'
                  10. Bracts Oxblood Red. . . . . B. × Buttiana 'Pigeon Blood'
      3. Leaves almost evenly elliptic; bracts white or purple, fading or not in color with age; edges of bracts less crisped.
         11. Leaves variegated. . . . . B. glabra 'Variegata'
         11. Leaves green.
            12. Bracts persistent after flowering.
               13. Bracts white. . . . . B. glabra 'Snow White'

[1] Colors were matched with Ridgway, Color Standards and Color Nomenclature, 1912, and color-names here capitalized are those used in that work.

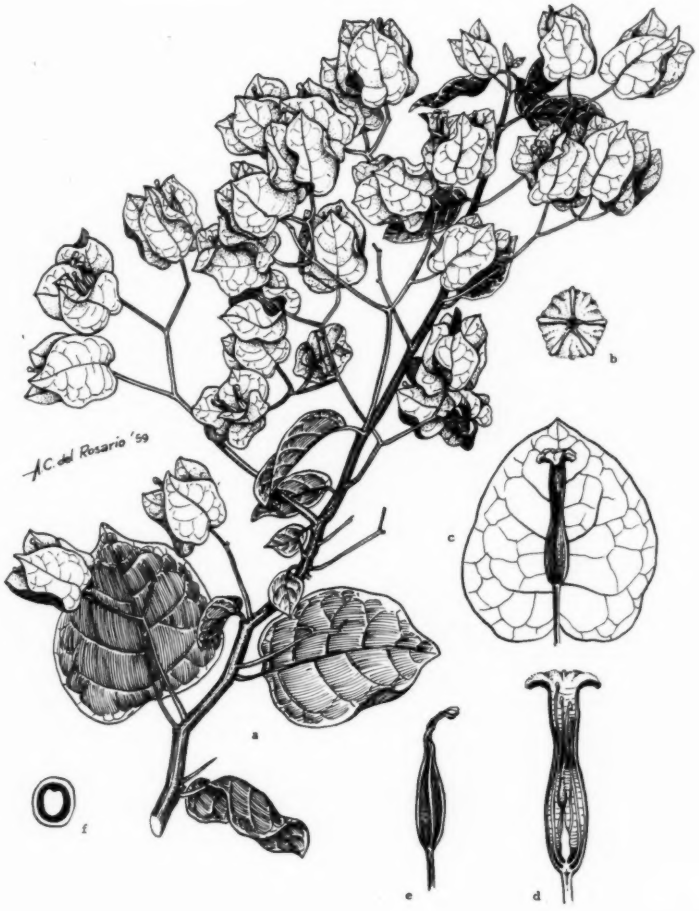

Fig. 28. Bougainvillea × Buttiana 'Mrs. Butt': a, flowering branch × 1/2; b, flower, top view × 6; c, flower and subtending bract × 2 1/2; d, flower in longitudinal section × 5; e, old flower-tube with shrivelled top × 2 1/2; f, ovary in cross-section × 5.

Fig. 29. Bougainvillea glabra 'Rainbow': a, flowering branch X 3/5; b, inflorescence thorn X 9; c, flower, top view X 9; d, old flower-tube with shrivelled top X 1 1/2; e, flower and subtending bract X 3; f, ovary in cross-section X 6; g, flower in longitudinal section X 6.

13. Bracts purple to Amaranth Pink.

14. Flower-tube 5-6 mm. across; bracts Light Phlox Purple. . . . . B. glabra 'Formosa'

14. Flower-tube 3 mm. or less across; bracts Amparo Purple, Violet Purple, or Amaranth Pink.

15. Bracts purple.

16. Bracts Amparo Purple, widest at 1/3 above the base, tapered to tip which forms an angle of about 45 degrees. . . . . B. glabra 'Sanderiana'

16. Bracts Violet Purple, elliptic, tip abruptly narrowed. . . . . B. glabra 'Penang'

15. Bracts Pale Amaranth Pink. . . . . B. glabra 'Lady Huggins'

12. Bracts not persistent after flowering.

17. Bracts 4.5 cm. or more long.

18. Bracts bright purple; leaves shiny. . . . . B. glabra 'Magnifica'

18. Bracts of lighter tone; leaves dull.

19. Flower-tube 2.5 cm. or more long; bracts Mallow Purple to Rhodamine Purple. . . . . B. 'Bois de Rose'

19. Flower-tube 2 m. or less long; bracts Mallow Purple to Spinel Pink. . . . . B. glabra 'Cypheri'

17. Bracts 4 cm. or less long.

20. Bracts Acajou Red to Pompeian Red. . . . . B. glabra 'Mrs. Leaño'

20. Bracts Light Mallow Purple. . . . . B. glabra 'Pink Beauty'

1. Perianth-tube, leaves, and stems pubescent, the hairs 1.3 mm. or more long.

21. Bracts 5-6 cm. long, purple or pink.

22. Bracts purple. . . . . B. spectabilis, typical

22. Bracts pink. . . . . B. spectabilis 'Thomasii'

21. Bracts 3.5 cm. or less long, red. . . . . B. spectabilis 'Lateritia'

Bougainvillea peruviana Humboldt and Bonpland, Plantae aequinoctiales 1: 174, t. 49, 1808.

In gardens this species is often represented by plants grown under the fancy-names 'Lady Hudson', 'Princess Margaret Rose', or 'Ecuador Pink'; according to Holttum, however, these so-called varieties are indistinguishable from one another, and apparently also from the typical species itself.

Leaves broadly-ovate, to 10.5 cm. long and 8 cm. wide; bracts light magenta pink, slightly crinkled, to 3.3 cm. long and 2 cm. wide, veins not green; flower-tube slender, glabrous except for the lower surface of rays.

Fig. 30. Bougainvillea spectabilis: a, flowering branch × 3/5; b, flower and subtending bract × 3/5; c, flower in longitudinal section × 1; d, old flower-tube with shrivelled top × 3/5; e, ovary in cross-section × 5.

This species is rarely seen in flower. Dr. Holttum has observed that "in pots it may be induced to flower more freely . . . by control of watering after the plant has made a good deal of strong leafy growth."

Holttum reports that "the natural distribution of B. peruviana seems to be in Columbia, Ecuador and Peru; that is, on the Pacific side of northern South America."

Bougainvillea × Buttiana Holttum and Standley, Publications of the Field Museum of Natural History [Chicago] - Botanical Series 23: 44, 1944 (Bougainvillea buttiana); Holttum, M. A. H. A. Magazine 12: 2, 1955.

The name Bougainvillea × Buttiana is used to designate all hybrids between B. peruviana and B. glabra. This "hybrid-species" is now distributed in tropical Asia, Central and South America.

Woody climber; leaves broadly ovate, to 11.5 cm. long and 8.8 cm. wide, the apex acuminate, the lower surface paler than the upper, glabrous, with puberulent midrib; bracts Rhodamine Purple to Rosolane Purple, 3.5 cm. long to 3.2 cm. wide, glabrous except the puberulent veins; flower-tube to 2.2 cm. long, constricted about the middle, the lower part widest slightly above its middle, to 2 mm. across, angled, puberulent. Cultivars known are: 'Mrs. Butt', which represents the typical form of this hybrid as described above (synonyms: 'Crimson Lake', 'Presas'); 'Louis Wathen', with Apricot Orange to Orange Vinaceous bracts; 'Mrs. McClean', similar to 'Louis Wathen', from which it differs in having the stamens enclosed, whereas the latter has the stamens exserted from the shortened tube, which lacks the expanded limb; 'Pigeon Blood', with Oxblood Red to Garnet Brown bracts; 'Scarlet Queen', with Amaranth Purple bracts.

The cultivar 'Golden Glow', the "yellow bougainvillea," with Antimony Yellow to Bittersweet Pink bracts, has been supposed to be a hybrid having B. × Buttiana as one parent, but its habit of producing bud-sports with bracts of the color of those of 'Mrs. Butt' has indicated the possibility of its being a bud-sport of 'Mrs. Butt' rather than a hybrid grown from seed.

Bougainvillea glabra Choisy in De Candolle, Prodromus 13: 437, 1849.

Leaves almost evenly elliptic, to 13 cm. long and 6 cm. wide, glabrous to sparsely hairy on both surfaces, the upper surface in some varieties shining, in some dull, the lower surface much paler than the upper with raised main veins that are sparsely hairy; bracts white or purple, fading or not in color with age; flower-tube distinctly swollen, 5-angled, bearing short upcurved hairs. A native of Brazil, now widely distributed in tropics of both hemispheres.

Many cultivars are known. 'Cypheri', which is distinguished by its Mallow Purple to Spinel Pink bracts, is a magnificent variety. 'Formosa', a showy and handsome-flowering variety from Brazil, is semi-scandent in habit and bears Light Phlox Purple bracts. The persistent bracts and the wide flower-tube which is distinctly angled distinguish this from other cultivars. 'Lady Huggins', with Pale Amaranth Pink bracts, is the palest of all the purples. 'Magnifica' has bright purple bracts and shiny leaves. 'Mrs. Leaño' is one of the finest varieties, with Acajou Red to Pompeian Red bracts. This plant flowers beautifully when almost bare of leaves after unusually dry weather. 'Penang', often called 'Dwarf Gem', is similar to 'Sanderiana', though it is perhaps somewhat deeper in tone (Violet Purple). 'Pink Beauty' is a free-flowering variety with Light Mallow Purple bracts borne on arching stems. 'Sanderiana', with Amparo Purple bracts, is one of the most popular cultivars as it is easily propagated and flowers continuously. 'Snow White', often referred to as "the white bougainvillea," is easily distinguished by its white bracts. 'Rainbow' has Coral Red to Mallow Purple bracts, and, though the bracts are not large, their considerable change in color as they develop produces a very striking effect.

Bougainvillea spectabilis Willdenow, Species Plantarum 2: 348, 1798.

Leaves ovate, to 10 cm. long and 6 cm. wide or even larger, densely tomentose on both surfaces; bracts purple; flower-tube bearing soft spreading hairs throughout, less distinctly angled. Brazil. Cultivar 'Thomasii' has pink bracts, while 'Lateritia' has smaller red bracts.

This species differs from B. glabra not only in its being densely pubescent but also in its different flowering season. Bougainvillea glabra flowers continuously while B. spectabilis flowers only in dry weather.

The cultivar 'Bois de Rose', with soft-pink bracts, is believed to be a hybrid involving B. spectabilis in its parentage.

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SUPPLEMENTARY NOTE ON COLUMNEA MOOREI

At the time I wrote the description I had no information concerning the native habitat of this plant. I have recently had a letter regarding it from the original collector. The original material of Columnea Moorei was collected by Mr. Henry P. Butcher. Mr. Butcher writes as follows:

> "Columnea moorei was collected on the trail from Cerro Azul to Cerro Pelon (or Luboba, as it is sometimes called), at an elevation of about 2200 feet. This range of hills lies directly north of Tacumen Airport and the head waters of the Chagres, Indio, and Pacara Rivers. It reaches its highest point in Cerro Jepe, about five miles further north. All the specimens that I have seen cling to the bark of the trees on which they grow. The exact location is about 13 1/2 miles north of Tacumen. The usual range of temperature in this area is from 85 degrees to 88 degrees in the daytime and 60 degrees to 79 degrees at night. There are times when it may go lower but rarely. The humidity is always high, never below 50."

C. V. Morton
Smithsonian Institution

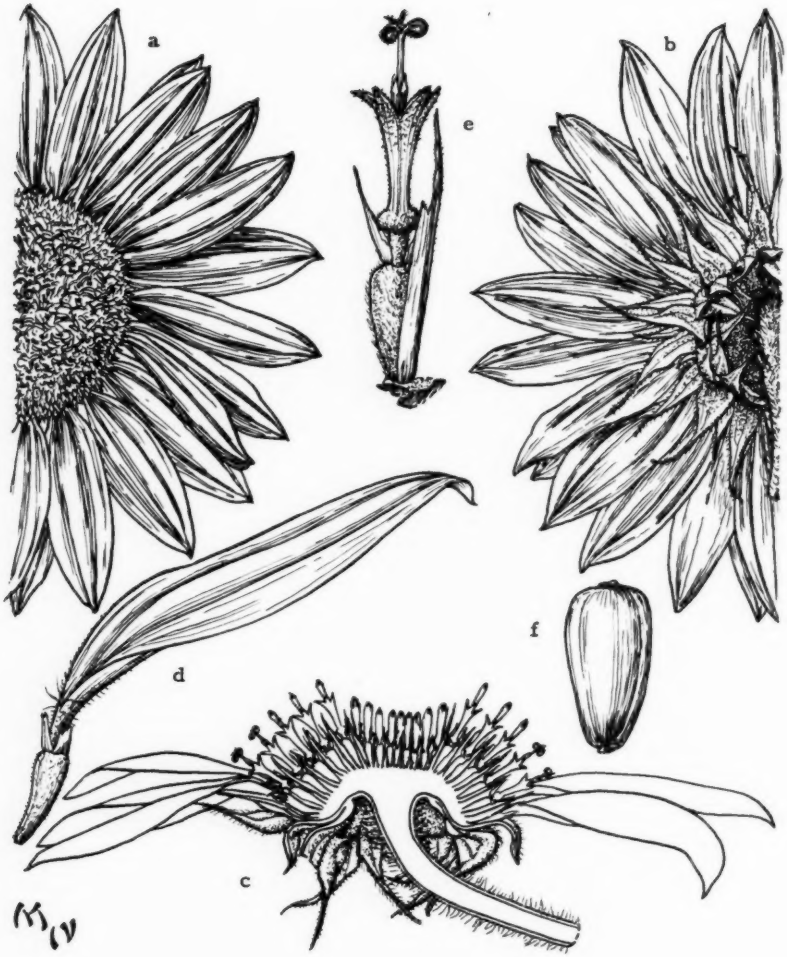


Fig. 31. Helianthus annuus, garden form: a head viewed from above × 4/5; b, head viewed from below × 4/5; c, head in vertical section × 1; d, ligulate floret × 1; e, disc-floret and subtending receptacular bract much enlarged; f, achene (pappus deciduous), enlarged.

Notes on the Cultivated Compositae
4. A Brief Discussion of the Inflorescence, for the Non-botanist

William J. Dress

This present article, which might more logically have been the first in this series of notes on the cultivated Compositae, is intended only as an aid to those readers who, lacking any training in plant taxonomy, have difficulty in understanding the organization and structure of the inflorescence in this family, or, even with such understanding, find the special terminology applied to it unfamiliar and troublesome. Since this, the largest family of flowering plants, is generally credited with something in the neighborhood of 950 genera and perhaps 15,000 - 20,000 species, the variations and modifications of the various organs are, as may be expected, legion. Only a rather general description will be attempted here, however, with examples and illustrations sufficient to show some of the variations and to enable the "non-botanist" to read other articles in this series with comprehension.

One of the factors which makes the Compositae seem to be a "difficult" family to work with is the very small size, even minuteness, of the florets and their parts. In this family more than in most others, a hand-lens of at least moderately good magnification (ca. 10×) is absolutely necessary in order to discern and examine adequately the floral organs during any attempt at satisfactory and successful identification. Anyone who has never previously used a lens to examine the true flowers in any composite will find it a fascinating experience to perceive and compare the myriad variations-on-a-theme expressed in the corollas, pappus, achenes, and other floral parts of even the commonest weeds and garden flowers belonging to this family.

In the Compositae, the basic unit of the whole inflorescence or flowering portion of the plant is the head (capitulum). This is composed of a variable number of true flowers (usually referred to as florets because of their small size), which are crowded closely together and sessile on a more or less fleshy, usually disk-like structure called the receptacle. Attached to the outer surface of the receptacle, and surrounding it, is an involucre made up of small-leaf-like or scale-like organs termed the involucral bracts

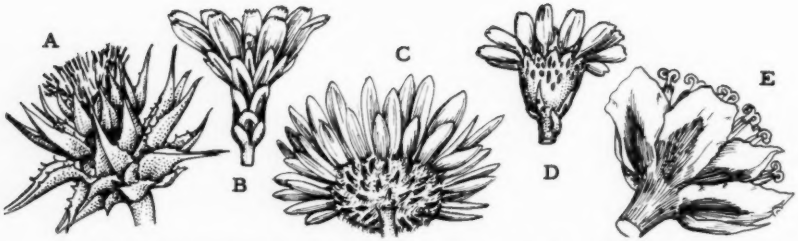


Fig. 32. A few examples of involucre types. A, Silybum Marianum × 1/2. B, Anisocoma acaulis × 4/5. C, Venidium fastuosum × 1/2. D, Thymophylla tenuiloba × 13. E, Hymenopappus scabioseus × 1 1/2.

or phyllaries. Ordinarily, when the layman (in this instance, anyone with no special understanding of plant morphology) speaks of the flower of a chrysanthemum, a dandelion, or a zinnia, it is actually the compound structure just described as a head which is meant. According to the particular species of composite involved, a plant's inflorescence may be represented by a solitary head or many heads, these borne on scapes, or at the ends of branches, or sessile in the axils of foliage-leaves, or in various other ways. In the genus Echinops, the globe-thistles, each individual head has been reduced to an involucre enclosing only a single floret, but a great many of these one-flowered heads are aggregated into a compound head which, in turn, is subtended by a (secondary) involucre.

With the basic structure of the head understood, we may take notice of some of the typical modifications of its component parts which may be met with among the cultivated composites.

The involucre (see fig. 32), to start with, may be composed of: (1) two to several ranks or rows of phyllaries, either all of approximately the same length or else imbricated - i.e., of graduated lengths, with those of the outermost ranks shortest and overlapping the bases of the next, inner, longer phyllaries; or (2) a single row of phyllaries, the latter separate and distinct from one another or fused to form a cup-like involucre. In texture, phyllaries range from green and almost leaflike to dry and scarious, and often colored, and may have any one of many different shapes, margins, and vestitures. In some genera or species the head may be subtended by a whorl or cluster of bracts not much different from the leaves, in addition to the true involucre.

The receptacle, enclosed by the involucre, is really the enlarged apex of the stem or branch upon which the head is borne, and has a characteristic shape in each species, a shape which is best seen in a vertical section of the head. Some types, though they do not include the extremes, are shown in fig. 33. In some genera, the receptacle is characteristically furnished, over all or

part of its surface, with small erect scales or bracts (pales), each one of which subtends a floret (as in fig. 31e). Often referred to as the "chaff" or chaffy bracts, these are not to be confused with involucral bracts (phyllaries). The receptacular bracts are most often scarious in texture, and may be deciduous (falling away with the florets) or persistent; in the thistles, they have been transformed into bristles. When there are no such bracts present the receptacle is referred to as naked.

The florets, though varying in other characteristics, have in common an inferior ovary (formed of two carpels and containing a single basally attached ovule in the single locule), a gamopetalous corolla, and a calyx so modified as to be scarcely recognizable as such. The corollas are of two general types. One of these is tubular, with a cylindrical or narrowly funnelform tube and 5 (rarely 4) triangular or lanceolate lobes. This type is most commonly actinomorphic or regular (figs. 31e and 34A-Ja), but in some genera may be decidedly zygomorphic (bilaterally symmetrical) (fig. 34Ka) and may even approach the appearance of a ligulate corolla (fig. 34Jb). The ligulate type of corolla is always zygomorphic, being shortly tubular at the base but expanded above into a flat, usually strap-shaped structure known as the ligule. In the tribe Cichorieae, the ligules are 5-lobed at the tips (fig. 34L, M), but in other tribes they are usually 3-lobed (fig. 34N-P), indicating that only three of the corolla lobes enter their make-up, or the lobing may be obsolete (fig. 31d); the other two lobes may be evident in vestigial form opposite the ligule (fig. 34Kb) or may be quite obsolete (lost in the course of evolution) (fig. 34N-P).

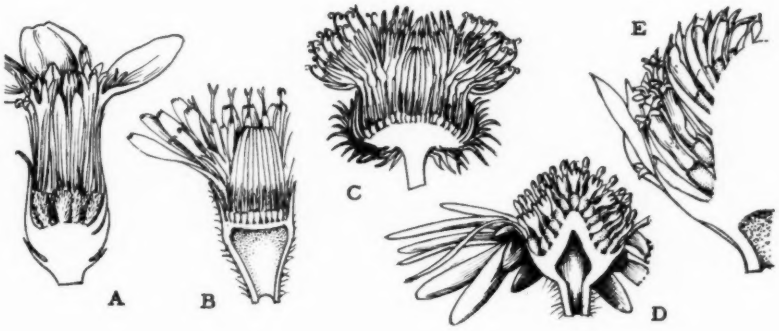


Fig. 33. Vertical sections of heads, showing examples of receptacles. A, Sericocarpus asteroides × 3. B, Leontodon autumnalis × 1 1/2. C, Jurinea mollis × 4/5. D, Bellis perennis × 2 1/2. E, Spilanthes oleracea × 3.

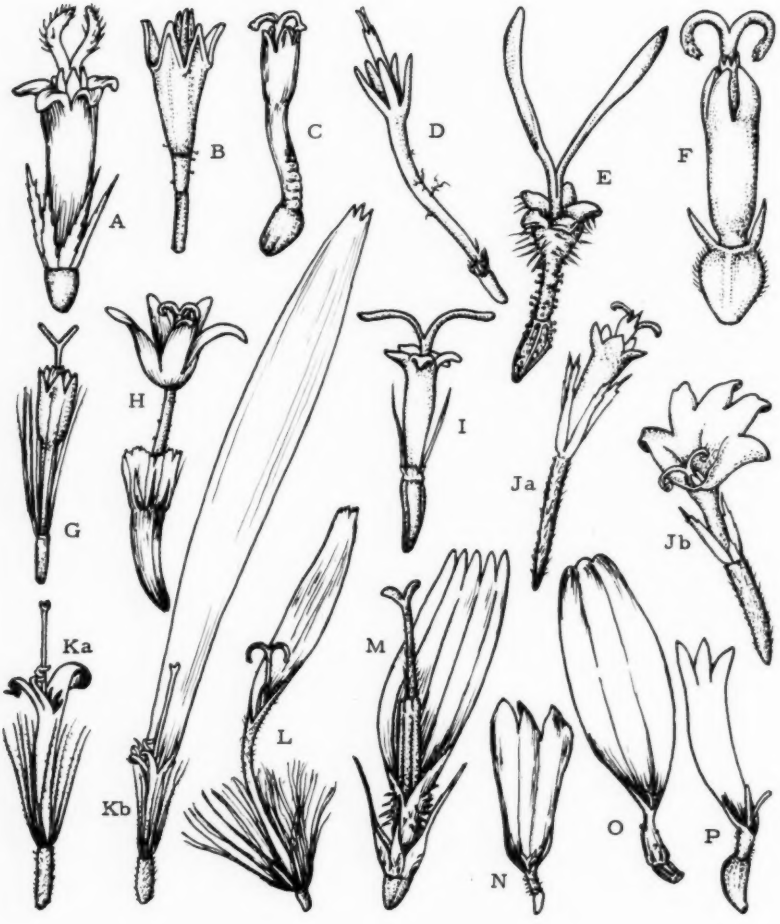


Fig. 34. Examples of florets in the Compositae. A, Gutierrezia Sarothrae × 10. B, Calendula Balansae × 5. C, Cladanthus arabicus × 6. D, Crupina vulgaris × 3. E, Ageratum Houstonianum × 6. F, Actinomeris alternifolia × 5. G, Inula salicina × 3. H, Palafoxia texana × 3. I, Stevia ovata × 5. J, Chaenactis Fremontii × 3: a, actinomorphic inner disc-floret; b, zygomorphic marginal disc-floret. K, Gerbera Jamesonii: a, disc-floret × 3; b, ray-floret × 2 1/2. L, Picridium tingitanum × 2 1/2. M, Catananche caerulea × 3. N, Verbesina encelioides × 3. O, Matricaria Chamomilla × 5. P, Madia elegans × 1 1/2.

In the tribe Cichorieae, which includes the dandelion, chicory, and lettuce, the heads are composed entirely of 5-lobed ligulate florets. In some entire tribes and in many genera and species of other tribes, on the other hand, the head contains only tubular florets, though in some cases the outermost of these may differ considerably from the innermost in having the limb (that part which is above the tube) expanded so that they almost resemble ligulate florets (fig. 34Jb). In the heads of the majority of species, however, there is a central disc of tubular florets surrounded by a marginal row or rows of ligulate florets, this rank of ligulate florets being known as the ray. Because of this common and familiar arrangement, tubular flowers in general are often termed disc- (or disk-) florets, and ligulate florets are known as ray-florets.

In dealing with ornamental composites, it must be remembered that many cultivated representatives have been so modified through preservation and encouragement of mutated forms that the composition of the heads may differ considerably from those of the ancestral wild and natural forms. The commonest type of such change has been the partial or complete replacement of the tubular disc-florets by ligulate florets in many cultivars of such groups as chrysanthemums, Shasta daisies, sunflowers, zinnias, and others in which "normally" the head consists of a central disc of tubular florets and a marginal row, only, of ligulate flowers. Such mutated forms are the familiar "double" forms, as contrasted with the so-called "single" natural types. Most gardeners are familiar with many of the other kinds of variation which have arisen or been perpetuated under cultivation. It must be borne in mind that it may not always be possible, by means of keys based on characteristics of the "normal" wild forms, to identify readily or accurately such mutated forms.

In the Compositae, the calyx has geen so greatly modified that it is seldom referred to by that term, and is known instead as the pappus. This pappus, which surmounts the ovary and, later, the

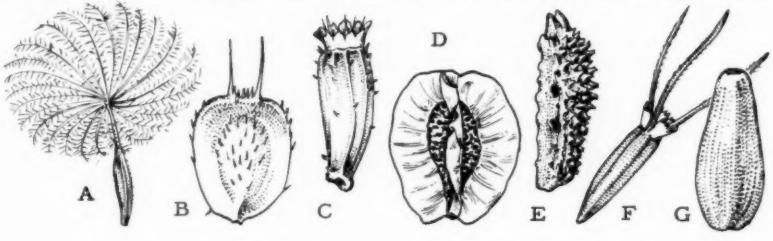


Fig. 35. Examples of various achene and pappus types. A, Tragopogon pratensis × 4/5. B, Boltonia asteroides × 8. C, Ageratum Houstonianum × 13. D, Osteospermum amplectens × 4. E, Thelesperma Burridgianum × 5. F, Stevia ovata × 6. G, Gamolepis Tagetes × 8.

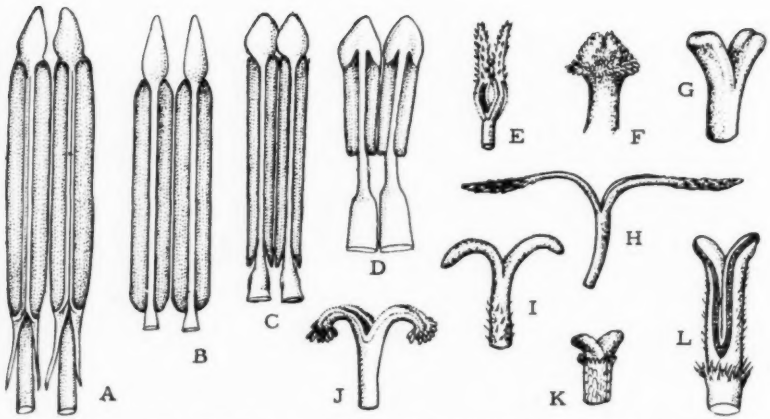


Fig. 36. A-D, examples of anther types (filaments cut short). A, Waitzia aurea × 24. B, Xanthisma texanum × 16. C, Heliopsis scabra × 13. D, Petasites alba × 29. E-L, examples of style-branches. E, Chrysopsis mariana × 8. F, Calendula Balansae × 16. G, Achillea filipendulina × 25. H, Gynura aurantiaca × 5. I, Anisocoma acaulis × 13. J, Diotis maritima × 10. K, Xeranthemum annuum × 16. L, Crupina vulgaris × 19.

fruit or achene, may consist of a few to many short or long chaffy scales (paleae), stiff straight or hooked awns or bristles, or fine capillary (hair-like) bristles. Examples of a few types may be seen in figs. 34 and 35, including such modifications as the union of scales to form a crown (fig. 35C), and the branching of capillary bristles, a condition termed plumose (fig. 35A). When two different types of pappus, such as a combination of short scales and long bristles, occur in the same floret, the combination is called a double pappus (fig. 35F). The pappus may be deciduous and fall away from the top of the ovary at some stage in the latter's development (as in Helianthus, fig. 31), or it may be persistent and remain firmly affixed to the ripened fruit. In some instances, the evolutionary process of reduction has eliminated the pappus altogether (fig. 34B, C).

The stamens, except in a few instances, are five in number and are attached by their filaments in the lower part of the tube. The anthers are oblong or linear, have a terminal triangular, ovate, or lanceolate appendage above the anther sacs, and the latter may be rounded, pointed, or caudate (drawn out into a "tail") (fig. 36A-D) at their bases. Except in a few genera of no horticultural importance, the anthers are syngenesious, i.e., coherent by their lateral margins and forming a tube, into which the pollen is shed and through which the style is gradually exserted, pushing out the pollen as it emerges.

The style is divided terminally into two branches, which, like the other floral organs, are variously modified in length, apex, and in the delimitation of the stigmatic area - the area receptive to the pollen grains and conducive to their germination. Although these characteristics of the style branches are of importance in defining the tribes of the Compositae, and are frequently met with in published keys, they are not generally of much assistance to the non-botanist equipped only with a hand-lens. For this reason they are not described in detail here, though fig. 36E-L illustrates several types of style branches. Since the definition of the major taxonomic groups within the family Compositae usually is based on a combination of characteristics, the other more evident and easily discerned characteristics will generally be more practically useful in identifying these groups.

The fruits of composites are achenes, since they are indehiscent and one-seeded. (Though often called "seeds" by the layman, they actually enclose the true seeds.) They are commonly linear, oblong, or obovate, either cylindrical or more or less flattened, angled, or ribbed, but many different forms occur, some of them quite bizarre (fig. 35). The pappus, especially when it is composed of barbed bristles or is capillary, may aid in distribution of the achenes, in the first instance by becoming attached to passing animals, in the other by serving as a "sail" enabling the achenes to ride the wind.

The distribution of the sexes in the flowers is by no means uniform. In the Cichorieae, the tribe in which all the florets are of the 5-lobed ligulate type, the florets are all hermaphroditic, i.e., bisexual, with both stamens and pistil functional. In other tribes, disc-florets are usually also hermaphroditic, but at times may be functionally only staminate and then produce no fertile fruit; when marginal disc-florets are enlarged and ligule-simulating, they may even be completely sterile. Outside the Cichorieae, ligulate florets are only pistillate and devoid of stamens, but at times, as in the sunflower (fig. 31d), they may lack even the style and be entirely sterile, in which case the term "neutral" is applied to them.

For convenience, the Compositae are divided, generally, into two subfamilies (Tubuliflorae, Liguliflorae) and twelve or thirteen tribes, which are groups of genera with apparent natural affinities, as evidenced by their possessing in common certain combinations of characteristics. Genera and species are usually distinguished technically on combinations of fewer characteristics, or even on the basis of a single characteristic. The types of characteristics which are most important in this classification have here been only very sketchily discussed, but, it is hoped, sufficiently, so that any gardener may read understandingly and profitably the articles of this series on the cultivated composites.

Book Reviews

Flora der Cultuurgewassen van Nederland. I, Nederlandse Dendrologie, by B. K. Boom. 480 pp., with 184 figures. Published by H. Veenman & Zonen N. V., Wageningen, Netherlands. 1959. 42.50 Guilders [$10.50].

This Flora, projected to occupy four volumes, promises to be a complete manual of the cultivated ornamental plants of Holland. Written in Dutch, it is primarily useful to plantsmen of that country, but its scope is so broad and its treatment so scholarly and thorough that it seems destined to become an essential reference work for all serious plantsmen.

This first volume accounts for all woody ornamentals known to be cultivated in Holland, with the term "woody" interpreted in its broadest sense, to include such suffrutescent subshrubs as Epigaea, Vinca minor, Mitchella repens, and Pachysandra terminalis. At the same time, one finds omitted the cultivated woody species of such genera as Acaena, Acantholimon, Astragalus, and others, presumably because they are not grown in Holland. In general, the coverage parallels closely that of Rehder's Manual of Cultivated Trees and Shrubs.

The plants are arranged by families, and largely in conformance with the Engler system of classification, as in Rehder. Original keys are provided for all groups through the rank of species, except for less important species that are intercalated subordinate to a better-known but related species. Double author citation is provided for all names below the rank of family, including those of cultivars.

Bibliographic references to classical or recent monographs and revisions of genera appear throughout the volume as footnotes. Many are of important but perhaps little-known recent papers in Dutch periodicals. Other reflect the author's adoption of current American and European studies.

The nomenclature follows the botanical code and the International Code of Nomenclature for Cultivated Plants. This volume is one of the first of it kind in any language to have consistently separated cultivars from botanical varieties, treating the former uniformly whether their names are in Latin or in a modern language. Synonymy is provided for cultivar names of plants originally published as botanical taxa.

The number of cultivars treated in this work is greater than in any other known to this reviewer. In a majority of instances, concise valuable bibliographic reference is given to place and date of

publication. In no other modern work are these data known to be available.

Critical readers of the volume will prize the very complete list of authors of plant names, and of institutions and firms from which plants have been introduced into cultivation. For each author's name are given pertinent dates of birth and death, and nationality of the person. This accounting by Dr. Boom is one of the most up-to-date and complete of its kind. Few errors or omissions have been noted in the enumeration, but among them is the assignment of the Arnold Arboretum to Ithaca [New York] instead of to Jamaica Plain [Massachusetts], and of the firm of Elwanger & Barry to Boston instead of to Rochester [New York]. In the listing, the name P. E. Boissier should read E. P. Boissier, and J. David should read I. David.

G. H. M. L.

Ornamental Crab Apples, by Arie den Boer. 226 pp., 4 color plates, 112 figures. Published by the American Association of Nurserymen, 635 Southern Building, Washington, D. C. $4.95.

Crab-apples, in the popular sense, are small-fruited apples, whose fruit are usually bitter or "crabbed" in taste. All belong - as does the common apple - to the genus Malus. Some are distinct species, and other are interspecific hybrids, but the majority of those in cultivation are cultivars of various origin and to be treated as clones. While a few kinds are grown for their edible fruit, most are prized for their use in the landscape where their ornamental value is measured in terms of flower, fruit, or autumn foliage color.

The book in hand represents more than a quarter-century of meticulous study of all the ornamental crab-apples known to be grown in America. While it is scarcely a horticultural monograph, as measured against McKelvey's "Lilacs" or Millais' "Rhododendrons," it does stand as the most comprehensive study available for this group. In it Mr. den Boer has given abundant cultural information, descriptions, brief notes, and often illustrations of typical foliage, of twenty-four species, eight interspecific hybrids having binomial names, four botanical varieties, and fifty-five cultivars.

The account for each entity is drawn primarily from the plants themselves and includes valuable details on the size and form of the plant, on flowering periods and coloration, and on the critical

distinguishing characters of each kind. Although there are no keys to aid one when identifying a crab-apple, there are provided a set of very useful tables on the diagnostic characters of growth habit, flowers, foliage, and fruit of all recognized kinds (on pp. 181-186), and associated data on date of introduction, place of origin, and horticultural situations for which each is recommended.

The nomenclature used in this volume identifies the author and the American Association of Nurserymen as probably the first in this country to have followed the directives of the current International Code of Nomenclature for Cultivated Plants. For the first time for crab-apples one may readily know which are hybrids or cultivars - and to be propagated as clones - and which are species or botanical varieties - and may be grown from seed. In the few instances where, unfortunately, one name is used for a particular cultivar in the text (e.g., Malus Soulardii 'Soulard') and another is used for the same plant in the tabular enumerations (e.g., Column Siberian), the former is always the correct name and should be followed.

In the absence of acknowledgement to the contrary, the illustrations are presumed to be the author's; the very accurate figures depicting selections of leaves of a given kind appear to have been made by the spatter-brush technique.

A nomenclatural innovation appearing perhaps for the first time in any horticultural monograph is the acceptance and application of the principle of commercial synonyms, as provided for by Article 37 of the Code. For example, the cultivar Malus 'Oekonomierat Echtermeyer' first introduced in Germany in 1914 under that name (which is its official name) is known almost universally in English-speaking countries as 'Echtermeyer'. This shortened form of the official name the author correctly identifies as a commercial synonym, and the publication of the latter is given for it in this volume by the American Association of Nurserymen - recognized as the official registrar for crab-apples. Similar treatment is given the cultivar names Malus 'Frau Luis Dittmann' and 'Exzellenz Thiel' whose commercial synonyms are given as 'Dittmann' and 'Thiel' respectively.

The volume is considered to be especially useful to the nurseryman and to the home-owner who either has crab-apples or who has a place for them in his plantings. In many respects it may serve as a model for authors of similar treatises, although it is to be hoped that the use of bold-face type for scientific names would be dropped in favor of the more conventional italics, that synonyms would be included and so indicated typographically in the index, and that greater care would be given to assure consistently correct use of such terms as species, variety, and form (which in the present volume are too often used loosely or even interchangeably).

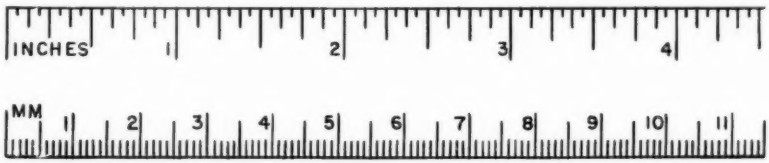
G.H.M.L.

ABBREVIATIONS USED IN BAILEYA

ann.	annual	dm.	decimeter	lf.	leaf
bien.	biennial	fl.	flower	lft.	leaflet
br.	branch	fls.	flowers	lvs.	leaves
brt.	branchlet	flt.	floret	mm.	millimeter
caps.	capsule	fr.	fruit	per.	perennial
cl.	clone	ft.	foot	segm.	segment
cm.	centimeter	hort.	horticultural	st.	stem
cv.	cultivar	in.	inch	sts.	stems
diam.	diameter	infl.	inflorescence	var.	variety

METRIC - ENGLISH EQUIVALENTS (approximate)

6 mm. - 1/4 in.	10 cm. - 4 in.	10 mm. - 1 cm.
12 mm. - 1/2 in.	1 dm. - 4 in.	10 cm. - 1 dm.
25 mm. - 1 in.	3 dm. - 1 ft.	10 dm. - 1 meter
2.5 cm. - 1 in.	10 dm. - 1 yd.	
5 cm. - 2 in.	1 m. - 39 in.	



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